PATENTTI- JA REKISTERIHALLITUS VÄLIPÄÄTÖS

14.01.99

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19. 01. 99

PL 100

00045 NOKIA GROUP

Patenttihakemus nro:	980538
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Asiamiehen viite:	7431 (FJ)
Määräpäivä	14.07.99

Patenttihakemuksen numero ja luokka on mainittava kirjelmässänne PRH:lle

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Patenttivaatimuksissa esitetty järjestelmä ja menetelmä ympäristömittausten suorittamiseksi ja mittaustietojen välittämiseksi ovat olennaisilta osiltaan ennestään tunnettuja EP-hakemusjulkaisusta 622625 (G 01 N 21/35). Hakemusta ei näin ollen voida hyväksyä.

EP-hakemusjulkaisusta 622625 (tiivistelmä) tunnetaan järjestelmä, jossa ilman laatua tarkkaillaan eri paikkoihin sijoitetuilla antureilla (20, 30, 40,50, 60, 70), jotka lähettävät antureiden mittaustiedot keskusyksikköön (80) satelliitin välityksellä, solukkoradiojärjestelmän kautta tai radioteitse.

Tekniikan tason julkaisuna esitetään julkaisut US-4814711 (G 01 V 3/08), GB-2233088 (G 01 N 33/18), US-5729197 (G 08 B 1/08) ja US-5568535 (H 04 M 11/04).

Ruotsinkielinen tiivistelmä puuttuu.

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Liitteenä tutkimusraportti ja viitejulkaisukopiot

Lausumanne huomautusten johdosta on annettava viimeistään yllämainittuna määräpäivänä. Jollette ole antanut lausumaanne virastoon viimeistään mainittuna määräpäivänä tai ryhtynyt toimenpiteisiin tässä välipäätöksessä esitettyjen puutteellisuuksien korjaamiseksi, jätetään hakemus sillensä (patenttilain 15 §). Sillensä jätetty hakemus otetaan uudelleen käsiteltäväksi, jos Te neljän kuukauden kuluessa määräpäivästä annatte lausumanne tai ryhdytte toimenpiteisiin esitettyjen puutteellisuuksien korjaamiseksi ja samassa ajassa suoritatte vahvistetun maksun, 320 mk hakemuksen ottamisesta uudelleen käsiteltäväksi. Jos lausumanne on annettu virastoon oikeassa ajassa, mutta esitettyjä puutteellisuuksia ei ole siten korjattu, että hakemus voitaisiin hyväksyä, se hylätään, mikäli virastolla ei ole aihetta antaa Teille uutta välipäätöstä (patenttilain 16 §). Uusi keksinnön selitys, siihen tehdyt lisäykset ja uudet patenttivaatimukset on aina jätettävä kahtena kappaleena ja tällöin on otettava huomioon patenttiasetuksen 19 §.

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(12) UK Patent Application (19) GB (11) 2 233 088 (13) A

(43) Date of A publication 02.01.1991

(21) Application No 8914125.3

(22) Date of filing 20.06.1989

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(51) INT CL[5]
G01N 33/18 1/10

(52) UK CL (Edition K)
G1B BCE
U1S S1270

(56) Documents cited
GB 1496712 A DD 0271570 A
G01N 1/10

(58) Field of search
UK CL (Edition K) G1B BAA BCE BCX
INT CL[5] G01N
Online databases: WPI AND CLAIMS

(54) Monitoring water pollution

(57) A parameter of a water body e.g. acidity, turbidity or temperature is continuously monitored by sensors to provide an output signal which actuates a H_2O sampler when the signal falls outside a certain range.

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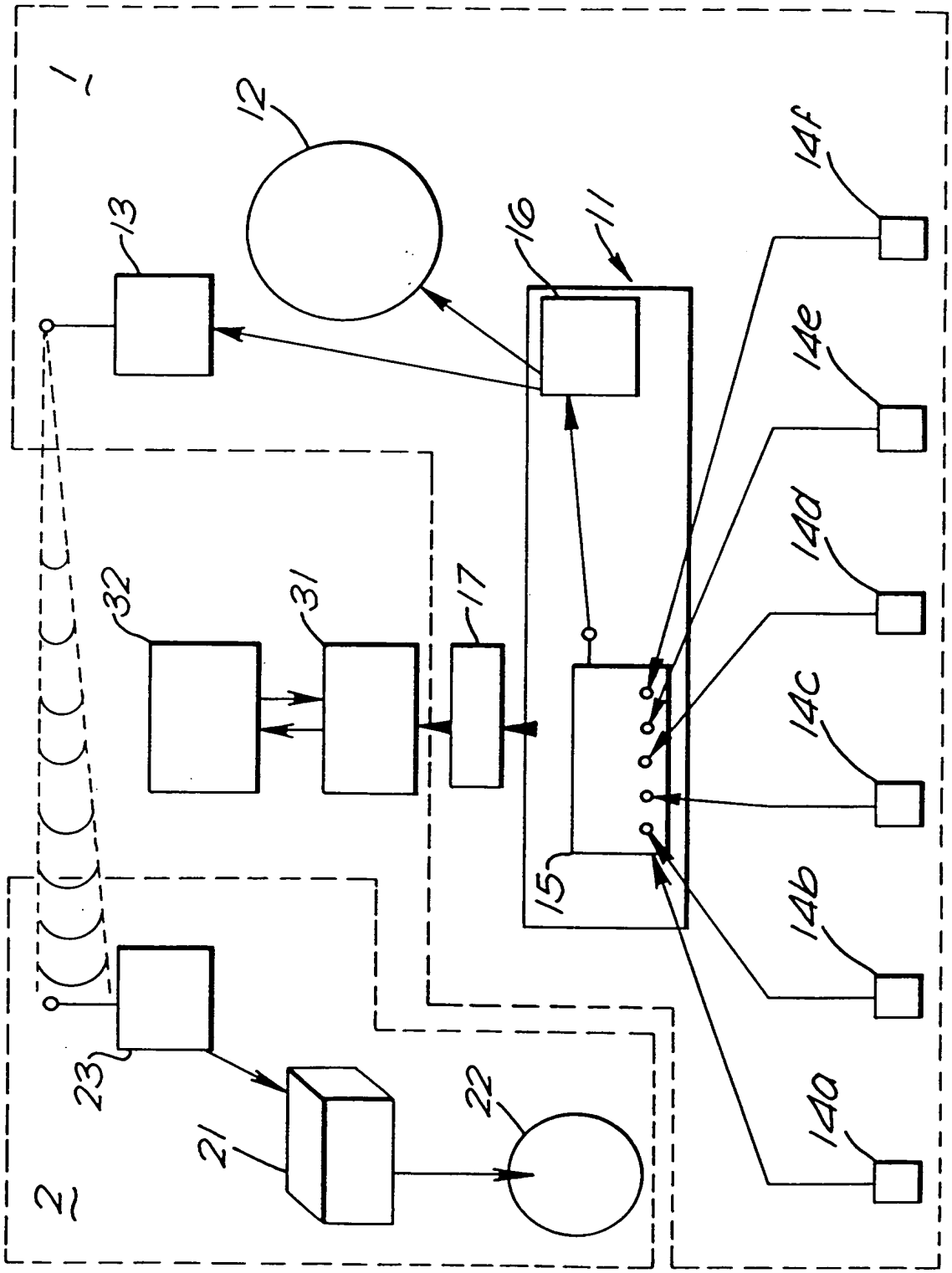
At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.
The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1982.

FIG. 1



APPARATUS AND METHOD FOR MONITORING POLLUTION

This invention relates to an apparatus and method for monitoring pollution, particularly of rivers or other bodies of water.

It is has been the case that those concerned with the monitoring of the pollution of a river have had to rely on visual signs of pollution, such as a discolouration of the water, or the presence of dead fish in the water. By the time these effects have been reported, and an investigation has begun into the source of the pollution, it is often the case that the discharge which caused the problem has stopped, and the polluted water has moved a considerable distance downstream from the source of the pollution. This means that it is difficult to determine the source of the polluting discharge. Even when it is reasonably clear who was responsible for the discharge, it is difficult to obtain proof as to who was responsible.

It is also the case that the effects of pollution can be dealt with more easily if the existence of a problem is known at an early stage.

The present invention seeks to provide an apparatus and a method which allow the source of a polluting discharge into a river to be identified quickly and with certainty.

According to a first aspect of the present invention, there is provided an apparatus for detecting pollution of water, the apparatus comprising at least one sensor, for continually monitoring a property of the water and providing an output signal corresponding to a measured value thereof, and a sampler which automatically takes a sample of the water when the measured value falls outside a predetermined range.

Preferably, the apparatus includes a group of sensors monitoring different properties of the water, and the sampler is operated when any one of the

measured values falls outside a respective range of values.

In a preferred embodiment of the invention, the apparatus includes a plurality of groups of sensors, with a respective sampler being assigned to each group, wherein, when the measured value from one sensor in one group falls outside a respective range, the sampler assigned to that group of sensors, and the sampler assigned to at least one other group of sensors, both automatically take samples of the water.

In a further preferred embodiment of the invention, the apparatus includes an alarm system, wherein, when the measured value from one sensor falls outside the respective range of values, an alarm signal is transmitted to a user of the apparatus. Preferably, the alarm signal is transmitted via the cellular telephone network.

Preferably, the or each group of sensors includes sensors for measuring at least some of the following properties of the water, namely:

the amount of oxygen dissolved in the water, the ammonia content, acidity, electrical conductivity, turbidity, temperature and flow rate. However, any instrument which provides an appropriate output signal can be used.

According to a second aspect of the present invention, there is provided a method of monitoring the pollution of water, comprising continually monitoring the value of at least one property of the water and, when the measured value falls outside a predetermined range of values, automatically taking a sample of the water.

For a better understanding of the present invention, and to show how it may be brought into effect, reference will now be made, by way of example, to the accompanying drawing, in which:-

Figure 1 is a schematic illustration of apparatus according to a first aspect of the invention.

The apparatus shown in Figure 1 includes devices located at a first site 1 and a second site 2. In practice, it is preferred that the apparatus includes devices located at as many sites as are required to allow accurate monitoring of the whole body of water which is of interest. Located at the first site 1 is a control device 11 connected to an automatic sampling machine 12 and a radio transmitter/receiver 13. Located in the water at the first site are a plurality of probes 14a-14f, which provide input signals to a data logger 15 in the control unit 11, which also includes a trip device 16. Output signals from the control device 11 are also supplied to a modem 17.

Located at the second site 2 is equipment corresponding to that located at the first site 1. However, for the sake of clarity, the only equipment illustrated is the control device 21, the automatic sampling machine 22 and the radio transmitting/receiving device 23.

The modem 17 transmits information to and from a cellular telephone network, generally indicated by the reference numeral 31, and hence to and from a personal computer 32 provided with its own modem, which may be located in a home or an office or car, for example.

The sensor probes 14a-14f, which are placed in the water at the first site 1, and the sensors (not shown) which are located at the second and any other sites, include sensors which measure the quantity of dissolved oxygen in the water, the ammonia content of the water, and the acidity, electrical conductivity, turbidity and temperature of the water. In addition, a sensor is provided to measure the flow rate of the water, in order to detect any unusual changes in the flow rate which may indicate that there has been a discharge into

the water. The flow rate measurement can be carried out in one of two ways. If a flume is available at the measuring site, the rate of flow of the water can be calculated from the characteristics of the flume and the measured current depth. If no flume is available at the site, and it is not possible to install a temporary flume, an ultrasonic instrument can be set up to measure any rise and fall in the level of the water by measuring the distance between the ultrasonic head and the water level. In an attempt to determine whether measured changes in the properties of the water could result from natural causes, it is also advantageous to provide a sensor to detect rainfall at the site.

The probe sensors are supplied with power by batteries located at the site.

Signals from the sensors are supplied to, and stored in, a data logger, which may be of any suitable conventional type. Similarly, the sensors which are used can be of any type which provides a suitable output signal, for example a signal in the millivolt range, which can be captured by the data logger. For example, in some situations it may be useful to use as a probe an ion selective electrode.

As described above, the control device 11, which includes the data logger, also includes a trip device 16. The trip device 16 monitors the output signals from each of the probe sensors 14a-14f and, when the signal from any of the sensors exceeds a preset limit, a trip signal is output. A preset limit is set for each output signal on the basis of the acceptable level of the property which is measured by the corresponding sensor.

When the trip signal is output, the system reacts in three ways. Firstly, a signal is sent to the automatic sampling machine 22. This machine can be

programmed such that, when it receives a signal, it either takes a single sample of the water, or a number of samples at predetermined time intervals, or composite samples on a time average basis. The automatic sampling machine can be programmed either to operate for a predetermined time, or until no signal exceeds its preset limit, or until the system is reset by an operator.

The second reaction of the system, when the signal output from one of the probe sensors indicates that the value of one of the measured properties of the water has exceeded the preset level, is to send a signal to the radio transmitter/receiver 13. This device sends a radio signal to the radio transmitter/receiver 23 at the second site, and to the transmitter/receivers at any other sites within a given range from the first site. This given range can easily be as much as several kilometres. When the radio signal is received by the transmitter/receiver 23 at the second site, the automatic sampling machine 22 at the second site is triggered to take a sample of the water at that location. Preferably, the system includes equipment located at a considerable number of different sites located, for example, along the length of a river. Then, when there is an indication of a pollution condition at one such site, samples of the water are taken automatically at that site and at other sites upstream and downstream thereof. This allows an accurate assessment of the effects of and possibly the origin of the discharge. Morever, the samples which are taken can be used as evidence in any legal proceedings which may result. This is achieved without the need for manual sampling at a number of different sites, which is costly and time consuming.

The third reaction of the system when an alarm condition occurs is to alert an operator to the

existence of a problem. Connected to each control device 11, 21 via a modem is a cellular telephone. When an alarm condition occurs, the control device dials a preprogrammed telephone number at which a pollution control officer can be contacted. This operator can interrogate the data logger 15 at any time, but this capability is obviously of particular use when an alarm condition has been detected. To do this, the operator requires a computer provided with an appropriate modem. Thus, the operator can remotely retrieve all of the stored information from the data logger, while his computer can interpret the data and present it in a graphical form. This interrogation can be carried out from an office, or from home or even from a car.

Thus, there is provided a system which is flexible, self contained and easily transportable. It does not rely on external power sources, and is thus able to be operated in remote locations, although of course access to a cellular telephone network is required for some of the facilities of the described embodiment.

CLAIMS

1. Apparatus for detecting pollution of water, the apparatus comprising at least one sensor, for continually monitoring a property of the water and providing an output signal corresponding to a measured value thereof, and a sampler which automatically takes a sample of the water when the measured value falls outside a predetermined range.

2. Apparatus as claimed in claim 1, further including a group of sensors monitoring different properties of the water, wherein the sampler is operated when any one of the measured values falls outside a respective range of values.

3. Apparatus as claimed in claim 2, wherein the apparatus includes a plurality of groups of sensors, with a respective sampler being assigned to each group, wherein, when the measured value from one sensor in one group falls outside a respective range, the sampler assigned to that group of sensors, and the sampler assigned to at least one other group of sensors, both automatically take samples of the water.

4. Apparatus as claimed in any preceding claim, wherein the apparatus includes an alarm system, wherein, when the measured value from one sensor falls outside the respective range of values, an alarm signal is transmitted to a user of the apparatus.

5. Apparatus as claimed in claim 4, wherein the alarm signal is transmitted via the cellular telephone network.

6. Apparatus as claimed in claim 2, or in one of claims 3 to 5 when appended directly or indirectly thereto, wherein the or each group of sensors includes sensors for measuring at least some of the following properties of the water, namely:

the amount of oxygen dissolved in the water, the ammonia content, acidity, electrical conductivity,

turbidity, temperature and flow rate.

7. A method of monitoring the pollution of water, comprising continually monitoring the value of at least one property of the water and, when the measured value falls outside a predetermined range of values, automatically taking a sample of the water.

8. Apparatus for detecting pollution of water, substantially as herein described with reference to, and as shown in, the accompanying drawing.

9. A method of detecting pollution, substantially as herein described with reference to the accompanying drawing.

Published 1990 at The Patent Office, State House, 66 71 High Holborn, London WC1R 4TP. Further copies may be obtained from The Patent Office, Sales Branch, St Mary Cray, Orpington, Kent BR5 3RD. Printed by Multiplex techniques ltd, St Mary Cray, Kent, Con. 1/87

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